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Original article

THE UTILIZATION OF WATER HYACINTH (*EICHHORNIA CRASSIPES*) BY WEST AFRICAN DWARF (WAD) GROWING GOATS

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Confined growing goats were offered ad libitum sundried water hyacinth, cowpea pod and groundnut stubbles hand mixed in the respective proportions: 30:40:30 (diet 1); 30:30:40 (diet 2) and 40:30:30 (diet 3) to measure intake, feed conversion and rate of gain. Dry Matter Intake, DMI (56.14 ± 6.50g/kg dry matter intake (% of EW) 3.49 ± 0.30, feed conversion (g gain/kg feed) 47.24 ± 5.80 and rate of gain (gd 11.00 ± 2.80 of goats fed diet 3 were higher (P < 0.05) than the corresponding (P > 0.05) mean DM1 (49.88 ± 6.5Ogkg/BW). DM1 (% of BW) 3.11±0.30, feed conversion (g gain/kg feed) 40.55±5.80 and rate of gain (gd 8.37±2.80 of goats fed diets 1 and 2. Evaluation of sundried E. crassipes incorporated with legume residues for ruminant feeds at the maximum beneficial level of inclusion will be necessary.

Key Words: *Water hyacinth, growing goats, intake, feed efficiency and weight gain.*

INTRODUCTION

The livestock industry in West Africa has not been able to produce enough meat and milk for the existing population. Goat is one of the animals that produce these products (meat and milk). Primarily, the constraints to large scale goat production in the developing countries are unavailability of an adequate quantity and quality feed (Devendra *et al* 1983; Timon *et al* 1986). It is therefore necessary to explore all possible avenues to adequately increase small ruminants meat production for human consumption utilizing crop residues and water hyacinth which are of no direct biological value to man.

There have been few studies on ways of utilizing the low nutritive value crop residues including cowpea pod and groundnut stubble (Kossila, 1954; Owen 1981; Sundstil *et al*., 1984; Kossila, 1985; Doyle 1986) and on assessment of water hyacinth as a feed resource for ruminants (Van Soest *et al*, 1968; Baldwin *et al*., 1974; Osman *et al*., 1975; Van Soest, 1982; Knab, 1982). The present study was therefore aimed at assessing feed intake, rate of gain and feed efficiency of growing goats fed a basal diet composition of water hyacinth, cowpea pod and groundnut stubbles.

MATERIALS AND METHODS

Feed description and Preparation

Water hyacinth (*E. crassipes*) was collected from River Majidun in Ikorodu Local Government, Lagos State of Nigeria. The roots were cut-off and discarded, the stalks and leaves were chopped to 3cm in length and sundried for about 5 days at an environmental temperature (22.8 - 33.8°C) and relative humidity (54.0 - 96.0%). Cowpea pod and groundnut stubbles were purchased at Sabo Goat Market in Ikorodu, Lagos, Nigeria. Sundried water hyacinth, cowpea pod and groundnut st each component bagged in separate jute bags were stored on wooden racks under ambient condition until required for feeding.

Weighed water hyacinth; Cowpea pod and groundnut stubbles were hand mixed as experimental diets by the following respective proportions: 30:40:30 (diet 1); 30:30:40 (diet 2) and 40:30:30 (diet 3) as shown in Table 1. These diets were balanced to contain about 10.54% crude protein.

Twelve growing West African dwarf (WAD) goats (6 does and 6 bucks) of about 5 months of age weighing 6.00 to 6.50kg were procured from Lagos State Polytechnic small ruminant unit in Ikorodu. The animals were drenched and dipped against endo-and ecto-parasites and housed in individual pens measuring 1.5m x 1.5m concrete floor covered with wood shavings. They were allocated to the three experimental rations in a completely randomized design (Steel and Torrie, 1980). Goats were fed (DM basis) 3% of BW at 08.OOh and 14.OOh and each animal had free access to fresh water and salt lick daily. Each respective diet was weighed out daily and directly placed in feeder per goat, feed refusals were collected and weighed immediately before 08.00h meal. The study lasted 42 days including 7 days of adjustment to confinement. Each goat was weighed (non-shrunk) every 7 days of the growth trial.

Analytical Procedures

Dried and ground bulked feed samples were analysed for dry matter (residue after drying to constant weight at 100°C), ash (residue after ignition at 500°C), crude protein (Kjeldahl N x 6.25), ether extract or fat extract dry sample with ether for about 4 hours) and crude fibre (Goering and Van Soest, 1970). Analysis of variance (ANOVA) Statistical Analysis System Institute (SAS) 1989 for a completely randomized design was performed on the data and treatment means were differentiated using Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Chemical Composition

Composition of water hyacinth-based goat diets and proximate analysis of the diets are shown in Table 1 and chemical composition of the feed ingredients is depicted in Table 2. The DM contents b.f diets 1, 2 and 3 were similar with a mean value of 8 1.22%. Also the DM values of the feed ingredients were alike with a mean value of 81.07%.

The crude protein (UP), ether extract (EE) and the ash contents of the three diets were similar with the exception of the crude fibre (CF) of diet 3 which was about 25% below the similar mean CF value of diets 1 and 2 (30.75g/ 100g DM). This observation may be

ascribed to the relatively low CF value of *E. crassipes* which constituted 40% of diet 3.

Table 1:
Composition of water hyacinth-based goat diets.

Ingredients[a]	DIETS (g/ 100G DM)		
	I	II	III
Water hyacinth	30.00	30.00	40.00
Cowpea pods	40.00	30.00	30.00
Groundnut stubbles	30.00	40.00	30.00
Total	100.00	100.00	100.00
Proximate Analysis:			
Dry matter %	81.06	81.60	81.00
Crude protein	10.50	10.55	10.68
Ether extract	1.78	1.71	1.80
Ash	10.34	10.58	10.97
Crude fibre	31.00	30.50	22.94

[a]As fed basis

Table 2:
Chemical composition of feed ingredients (g/ l00g DM).

	Ingredients[a]		
	Water hyacinth (stalk + leaves)	Cowpea pods	Groundnut stubbies
Dry matter, %	80.60	81.00	81.60
Crude protein	10.80	8.20	8.30
Ether extract	2.30	1.90	1.31
Ash	14.06	7.70	10.13
Crude fibre	18.05	38.80	33.60

[a]Dry matter basis.

Table 3:
Performance of experimental goats on water hyacinth-based diets.

	DIETS			
Parameters	I	II	III	SE
Duration of experiment (days)	35	35	35	
	Live weight Changes (kg)			
Initial	6.50[a]	6.47[a]	6.49[a]	0.03
Final	6.5O[b]	6.76[b]	6.87[a]	0.08
Growth rate (gd-i)	8.55[b]	8.20[b]	11.00[a]	2.80
	Feed Intake			
Dry matter intake (g/kg BW)	49.76	50.00[b]	56. 14	6.50
Dry matter intake (% of BW)	3. 10	3. 12	3.49[a]	0.30
Feed conversion (g gain/kg feed)	41. 39	39.64[b]	47.24[a]	5.80

a,b = Means along the same row with identical letters are not significantly (P>0 .05) different.

Crude protein (CP) content of water hyacinth in this study 10.80g/ 100g DM was below the reported range of CP (12-19.8%) by Boyd (1968, 1974), Reza (1981). This observation might be due to the suggestion of Gosset (1971) and Boyd al (1975) that the nutrient content in the environment in which the E. crassipes is cultured influence the nitrogen and phosphorus levels of the water weed (E. crassipes). The observed high (g/ lOOg DM) a (14.06) and CF (18.05) in this study are similar to the contents of ash (17.53) and CF (18.00) reported by Reza (1981). The nutritive values of cowpea pod (Phaseolus vulgaris) and groundnut stubbles (Arachis hypogea) are similar to values reported by Oyenuga (1968) and Karig *et al*, (1983).

Feed intake and Performance

Dry matter intake (DM1) of goat fed diet 3 (56.14±6.50 gkg 'BW° was 3.49% BW and was 12.55% higher (P < 0.05) than the similar (P>0.05) mean intake (49.88gkg of goats fed diets 1 and 2. This observation on intake was similar to intake of goats fed wheat straw (54±24gkg (Houston ., 1988) and intake of sheep fed soybean stover (54.58gkg (Dada *et al*., 1998). The similarly low (P<0.05) mean DM1 of goats fed diets 1 and 2 (49.88gkg- 'BWO may be attributed to their relatively high CF content (Table 1). A considerable body of authors are in support of kw DM1 due to high CF content of forage (Jones *et al*, 1972; El Hag, 1976; Sharma *et al*, 1977; Huston, 1978; Devendra, 1g78; Brown *et al*, 1984, 1988; Hennessy *et al*, 1983; Huston *et al*., 1988; Lascano *et al*., 1993). Feed efficiency of goats led diet 3 with 40% water hyacinth inclusion (g gain/kg feed) (47.24±5.80) was superior (P<0.05) to the corresponding (P>0.05) mean (40.55±5.80) of goats fed diets 1 and 2 with 30% water hyacinth inclusion. In support of this observation, CF content of diet 3 (22.94g/lOOg DM) was 24% lower than the mean (30.2g/lOOg DM) similar CF content of diets 1 and 2.

There were no differences shown in the initial weight (P>0.05) of the goats in the three diet groups. However, at the termination of the study (35 days) the mean final weight of goats fed diet 3 (6.87kg) was significantly (P<0.05) higher than the similar (P>0.05) weights of goats fed diets 1 and 2 which were 6.80 and 6.76kg respectively. Growth rate (gd 1) of animals fed diet 3 (11.00±2.80) was also significantly (P<O.05) higher than 8.55 and 8.20 (±2.80) of goats fed the respective diets 1 and 2. The result indicates that utilization of sundried E. crassipes by growing goats at up to 40% dietary level of inclusion is beneficial contrary to previous reports of its low palatability and DM1 due to its high ash and alkali metals contents by Hossein (1959); Parra (1975); Chatterjee *et al*, 1988. Fuith beneficial level of inclusion of E. crassipes by growing goats will be necessary.

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